

said first and second pole pieces, and at least one winding for conducting welding current, said first and second pole pieces each having an end surface, said air gap defined between said end surfaces of said first and second pole pieces, each end surface including two outer edges and a middle portion positioned therebetween, at least one of said middle portions including a substantially V-shaped slot, said air gap having a width between said middle portions of said first and second pole pieces that is greater than a width between either of said outer edges of said first and second pole pieces, said air gap having a configuration which results in said inductance of said choke gradually changing with an output current of the welder without saturation in said air gap thereby eliminating inflection points during operation of said welder, said at least one winding and said core having a size to prevent saturation at a weld current of at least about 100 amperes.

86. (New) The output choke as defined in claim 85, wherein said air gap includes a converging width that at least partially converges toward at least one set of said inner and outer edges of said first and second pole pieces, at least a portion of said air gap having a width that is greater than the spacing between at least one set of said inner and outer edges.

87. (New) The output choke as defined in claim 85, wherein both said middle portions including substantially V-shaped slots.

88. (New) The output choke as defined in claim 86, wherein both said middle portions including substantially V-shaped slots.

89. (New) The output choke as defined in claim 87, wherein said substantially V-shaped slots at least partially diametrically opposed across said air gap from one another.

90. (New) The output choke as defined in claim 89, wherein said substantially V-shaped slots are fully diametrically opposed across said air gap from one another.

91. (New) The output choke as defined in claim 88, wherein said substantially V-shaped slots are fully diametrically opposed across said air gap from one another.

92. (New) The output choke as defined in claim 87, wherein said middle portions of said end surfaces of said first and second pole pieces having substantially the same shape.

93. (New) The output choke as defined in claim 90, wherein said substantially V-shaped slots are fully diametrically opposed across said air gap from one another.

94. (New) The output choke as defined in claim 91, wherein said substantially V-shaped slots are fully diametrically opposed across said air gap from one another.

95. (New) The output choke as defined in claim 85, wherein at least one of said substantially V-shaped slots is non-symmetrical.

96. (New) The output choke as defined in claim 93, wherein at least one of said substantially V-shaped slots is non-symmetrical.

97. (New) The output choke as defined in claim 94, wherein at least one of said substantially V-shaped slots is non-symmetrical.

98. (New) The output choke as defined in claim 85, wherein at least one of said substantially V-shaped slots is symmetrical.

99. (New) The output choke as defined in claim 93, wherein at least one of said substantially V-shaped slots is symmetrical.

100. (New) The output choke as defined in claim 94, wherein at least one of said substantially V-shaped slots is symmetrical.

101. (New) The output choke as defined in claim 85, wherein said outer edges of said end surfaces of said first and second pole pieces being connected together.

102. (New) The output choke as defined in claim 97, wherein said outer edges of said end surfaces of said first and second pole pieces being connected together.

103. (New) The output choke as defined in claim 100, wherein said outer edges of said end surfaces of said first and second pole pieces being connected together.

104. (New) The output choke as defined in claim 85, wherein both of said end surfaces are spaced from one another.

105. (New) The output choke as defined in claim 97, wherein both of said end surfaces are spaced from one another.

106. (New) The output choke as defined in claim 100, wherein both of said end surfaces are spaced from one another.

107. (New) The output choke as defined in claim 104, wherein said outer edges of said end surfaces of said first and second pole pieces are spaced apart at substantially the same distance.

108. (New) The output choke as defined in claim 105, wherein said outer edges of said end surfaces of said first and second pole pieces are spaced apart at substantially the same distance.

109. (New) The output choke as defined in claim 106, wherein said outer edges of said end surfaces of said first and second pole pieces are spaced apart at substantially the same distance.

110. (New) The output choke as defined in claim 85, wherein said air gap is at least partially filled with a low permeability material.

111. (New) The output choke as defined in claim 102, wherein said air gap is at least partially filled with a low permeability material.

112. (New) The output choke as defined in claim 103, wherein said air gap is at least partially filled with a low permeability material.

113. (New) The output choke as defined in claim 108, wherein said air gap is at least partially filled with a low permeability material.

114. (New) The output choke as defined in claim 109, wherein said air gap is at least partially filled with a low permeability material.

115. (New) The output choke as defined in claim 85, wherein said at least a portion of said air gap has a varying width to cause substantially gradual varying of the inductance of said choke over a majority of a current range of said choke.

116. (New) The output choke as defined in claim 111, wherein said at least a portion of said air gap has a varying width to cause substantially gradual varying of the inductance of said choke over a majority of a current range of said choke.

117. (New) The output choke as defined in claim 112, wherein said at least a portion of said air gap has a varying width to cause substantially gradual varying of the inductance of said choke over a majority of a current range of said choke.

118. (New) The output choke as defined in claim 113, wherein said at least a portion of said air gap has a varying width to cause substantially gradual varying of the inductance of said choke over a majority of a current range of said choke.

119. (New) The output choke as defined in claim 114, wherein said at least a portion of said air gap has a varying width to cause substantially gradual varying of the inductance of said choke over a majority of a current range of said choke.

120. (New) The output choke as defined in claim 115, wherein said inductance of said choke at least partially varies generally inversely proportional to said weld current.

121. (New) The output choke as defined in claim 120, wherein said inductance of said choke at least partially varies in a generally straight line to said weld current.

122. (New) The output choke as defined in claim 120, wherein said inductance of said choke at least partially varies in curvilinearly to said weld current.

123. (New) An output choke for a D.C. arc welder having an inductance comprising a high permeability core having first and second pole pieces and an inductance controlling air gap formed by said first and second pole pieces, said first and second pole pieces each having an end surface, said air gap defined between said end surfaces of said first and second pole pieces, each of said end surfaces including two outer edges and a middle portion positioned therebetween, each of said middle portions including a substantially V-shaped slot to form a substantially diamond shaped air gap between said middle portions, said air gap having a configuration and being spaced apart at a varying distance resulting in said inductance of said choke changing with an output current of the welder without saturation in said air gap thereby substantially eliminating inflection points during operation of said welder and substantially gradually varying the inductance of said choke over substantially a complete current range of said choke.

124. (New) The output choke as defined in claim 123, wherein each of said middle portions of said end surfaces of said first and second pole pieces having substantially the same shape.

125. (New) The output choke as defined in claim 123, wherein at least one set of said outer edges of said end surfaces of said first and second pole pieces is spaced apart.

126. (New) The output choke as defined in claim 124, wherein at least one set of said outer edges of said end surfaces of said first and second pole pieces is spaced apart.

127. (New) The output choke as defined in claim 125, wherein both sets of said outer edges of said end surfaces of said first and second pole pieces are spaced substantially the same distance apart.

128. (New) The output choke as defined in claim 126, wherein both sets of said outer edges of said end surfaces of said first and second pole pieces are spaced substantially the same distance apart.

129. (New) The output choke as defined in claim 123, wherein said choke includes at least one winding for conducting welding current, said at least one winding and said core having a sufficient size to prevent saturation at a weld current of at least about 100 amperes.

130. (New) The output choke as defined in claim 128, wherein said choke includes at least one winding for conducting welding current, said at least one winding and said core having a sufficient size to prevent saturation at a weld current of at least about 100 amperes.

131. (New) The output choke as defined in claim 123, wherein said air gap has a configuration that causes said inductance of said choke to gradually vary over a current range in an inverse relationship with a weld current.

132. (New) The output choke as defined in claim 130, wherein said air gap has a configuration that causes said inductance of said choke to gradually vary over a current range in an inverse relationship with a weld current.

133. (New) The output choke as defined in claim 123, wherein said air gap is at least partially filled with a low permeability material.

134. (New) The output choke as defined in claim 132, wherein said air gap is at least partially filled with a low permeability material.

135. (New) An output choke for a D.C. arc welder having an inductance and adapted to include at least one winding for conducting current, said output choke comprising a high permeability core having first and second pole pieces and an inductance controlling air gap, said air gap defined by an end surface on said first and second pole pieces, at least a portion of said end
5 surfaces of said first and second pole pieces being spaced from one another and facing one another, said end surfaces of said first and second pole pieces each having outer edges and a middle portion between said outer edges, at least one of said middle portions including a slot, at least a portion of said air gap having a varying width to vary the inductance of said choke over a current range, said air gap having a converging width that at least partially converges toward said outer edges, at least
10 a portion of said air gap having a width that is greater than the spacing between either corresponding set of the outer edges of said first and second pole pieces, said middle portions having a

configuration to substantially prevent inflection points along a saturation curve of said choke, said middle portions having substantially non-perpendicular oriented surfaces.

136. (New) The output choke as defined in claim 135, wherein said air gap having a varying shape and width to substantially gradually vary the inductance of said choke over substantially a complete current range of said choke.

137. (New) The output choke as defined in claim 136, wherein said inductance of said choke at least partially varies generally inversely proportional to said weld current.

138. (New) The output choke as defined in claim 137, wherein said inductance of said choke at least partially varies in a generally straight line to said weld current.

139. (New) The output choke as defined in claim 137, wherein said inductance of said choke at least partially varies in curvilinearly to said weld current.

140. (New) The output choke as defined in claim 135, wherein at least one of said middle portions being substantially V-shaped.

141. (New) The output choke as defined in claim 137, wherein at least one of said middle portions being substantially V-shaped.

142. (New) The output choke as defined in claim 140, wherein both of said middle portions being substantially V-shaped.

143. (New) The output choke as defined in claim 141, wherein both of said middle portions being substantially V-shaped.

144. (New) The output choke as defined in claim 142, wherein both of said middle portions having substantially the same shape.

145. (New) The output choke as defined in claim 143, wherein both of said middle portions having substantially the same shape.

146. (New) The output choke as defined in claim 135, wherein said air gap is at least partially filled with a low permeability material.

147. (New) The output choke as defined in claim 145, wherein said air gap is at least partially filled with a low permeability material.

148. (New) The output choke as defined in claim 135, wherein both sets of edges of said pole pieces contact one another.

149. (New) The output choke as defined in claim 147, wherein both sets of edges of said pole pieces contact one another.

150. (New) The output choke as defined in claim 135, wherein both sets of edges of said pole pieces are spaced from one another.

151. (New) The output choke as defined in claim 147, wherein both sets of edges of said pole pieces are spaced from one another.